Non-Potable Water Evaluation In the Eastern Portion of Jurupa Community Services District Service Area

Prepared for

Jurupa Community Services District

November 2010



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LIST OF TABLES

LIST OF FIGURES

APPENDICES

SECTION 1 - INTRODUCTION

The following report has been prepared in accordance with Webb's proposal, dated May 18, 2010 to evaluate the feasibility of supplying non-potable (untreated well water and reclaimed water) in the northeast portion of the Jurupa Community Services District's (JCSD) boundaries and Webb's proposal amendment, dated July 9, 2010 to evaluate the viability of reactivating the Indian Hills Wastewater Treatment Plant. Shown on **Figure 1-1** are the areas currently served non-potable water by JCSD and Empire Water Company, also shown are the areas currently served potable water for irrigation by JCSD, which could potentially be served by non-potable water if the non-potable water system is expanded. The non-potable water distribution options evaluated are listed below:

Option 1 - Utilize the District's existing Well No. 21 (**Figure 1-2**) or possibly drill a second well near the Well No. 21 site to provide non-potable water to potential non-potable water uses identified in Webb's May 2009 Non-Potable Water Study. This option also utilizes JCSD's 3 MG Sunnyslope reservoir[1] for storage of non-potable water to meet the potential non-potable irrigation demands discussed within this report (**Figure 1-2**).

Option 2 - Utilize Empire Water's existing distribution system to convey non-potable water from a new well and installing a new pump and motor at PHS, at the existing non-potable pump station site to pump water to JCSD's 3MG Sunnyslope reservoir for storage of non-potable water to meet the potential non-potable irrigation demands discussed within this report (**Figure 1-3**).

Option 3 –Reconstruct the Indian Hills Wastewater Treatment Plant (WWTP) to provide the District an additional 1.0 MGD of wastewater treatment capacity and recycled water for irrigation purposes at the Indian Hills Golf Course (**Figure 1-4**). Option 3 would remove the Indian Hills Golf Course from Empire Water's system, thereby freeing up Empire Water's wells to serve other irrigation areas currently served with potable water.

[1] With the completion of the 12 MG pre-stressed concrete reservoir (July 2010), the Sunnyslope reservoir could be used as a storage reservoir for non-potable purposes.

Option 4 - Utilize recycled water from the City of Riverside's WWTP to meet the District's irrigation demands in the eastern portion of the District's service area, thus freeing up groundwater in the Riverside Groundwater Basin to be used for purposes other than irrigation (**Figure 1-5**).

FIGURE 1-1

NON-POTABLE WATER SERVICE AREA

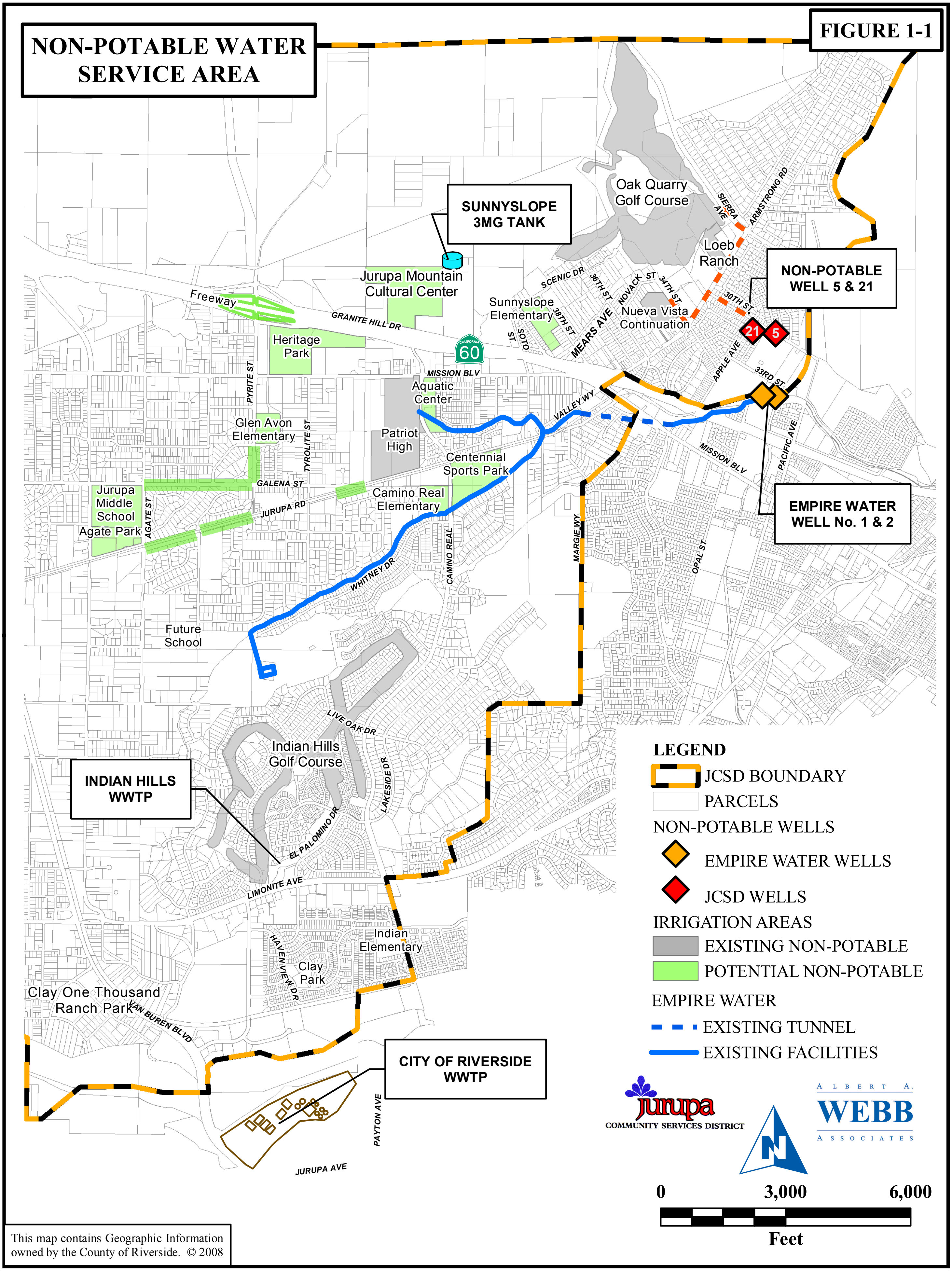

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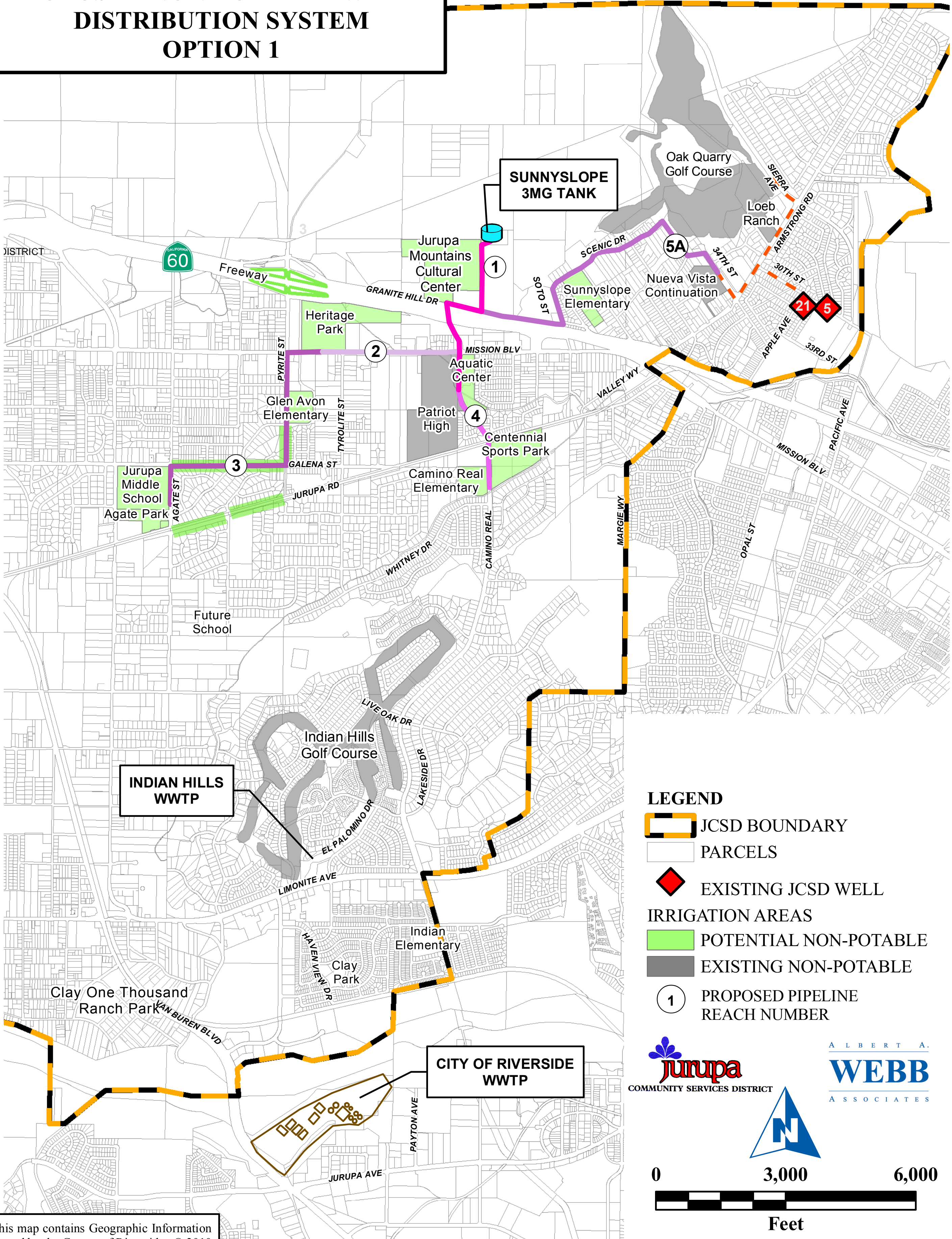
FIGURE 1-2

PROPOSED NON-POTABLE WATER DISTRIBUTION SYSTEM OPTION 1



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PROPOSED NON-POTABLE WATER DISTRIBUTION SYSTEM OPTION 2

FIGURE 1-3

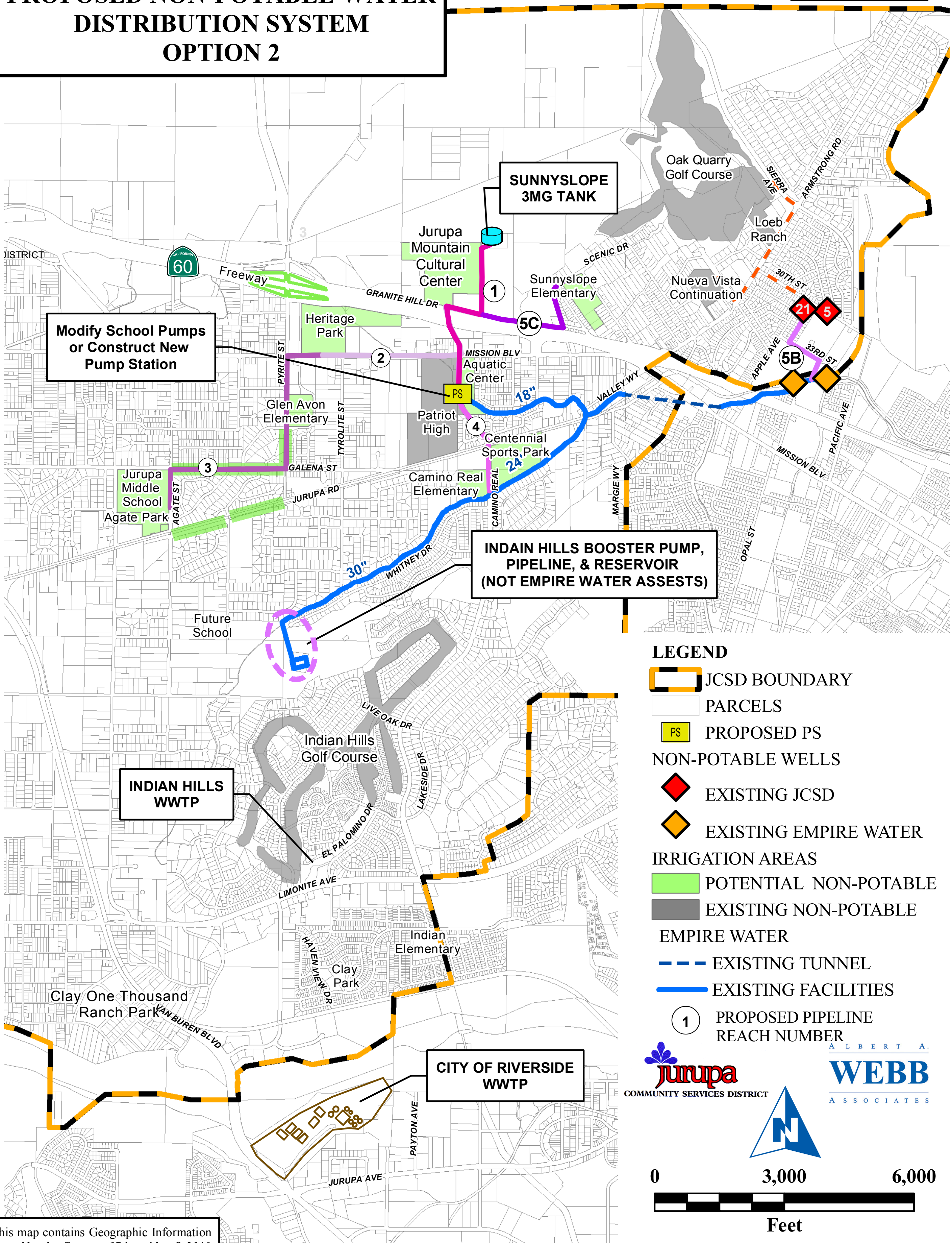

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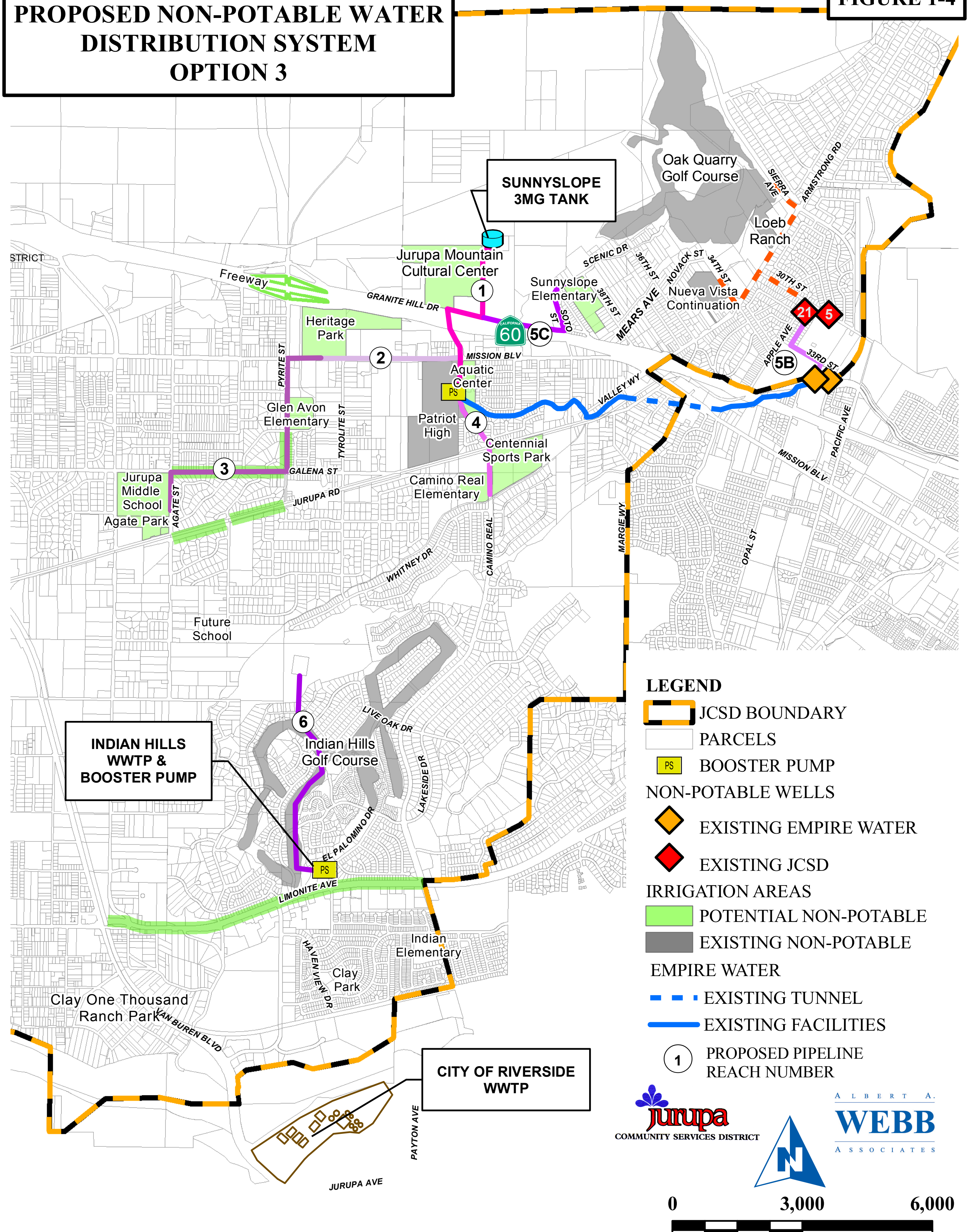
FIGURE 1-4

PROPOSED NON-POTABLE WATER DISTRIBUTION SYSTEM OPTION 3



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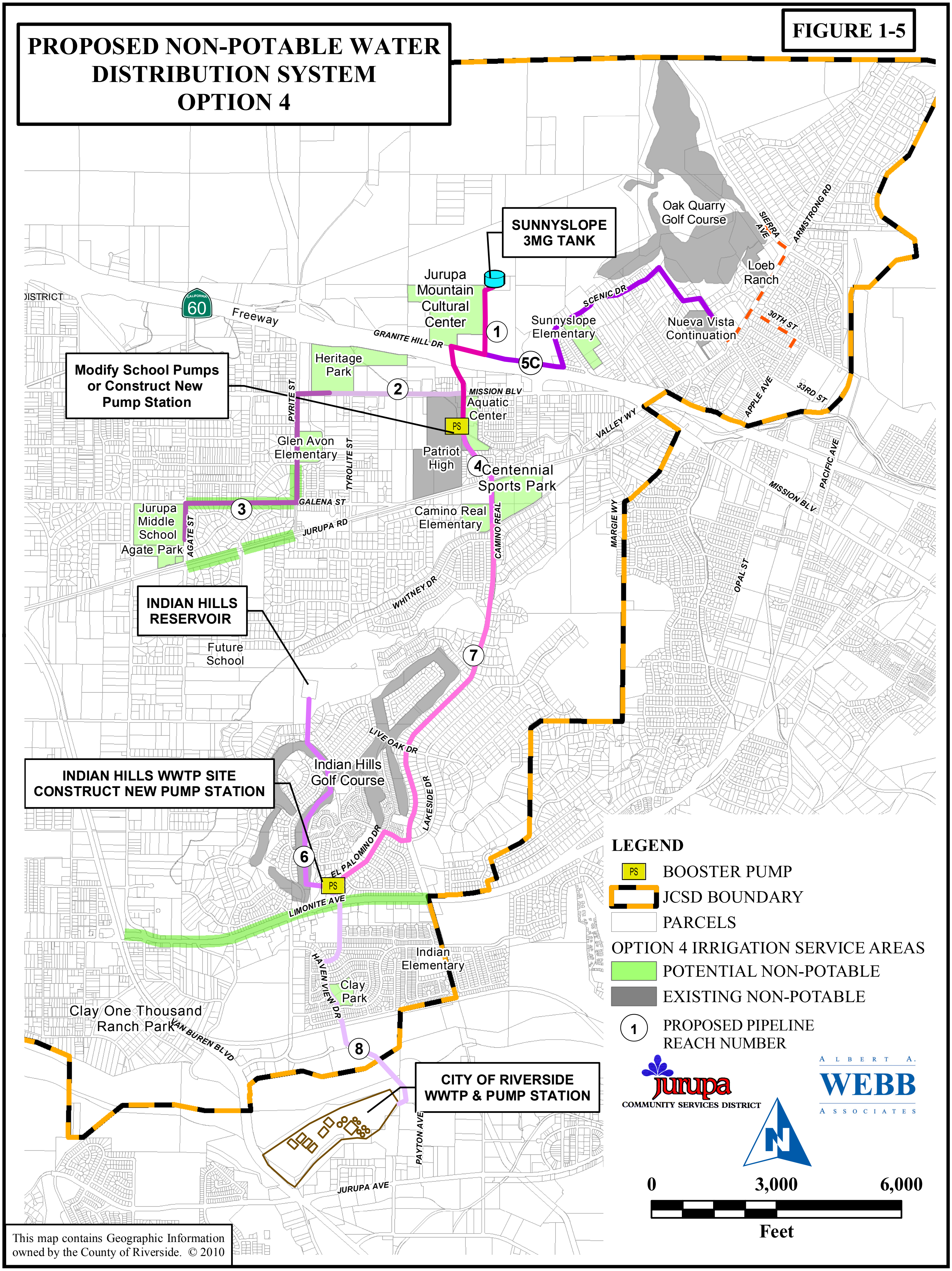
PROPOSED NON-POTABLE WATER DISTRIBUTION SYSTEM OPTION 4

FIGURE 1-5



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SECTION 2 - NON-POTABLE IRRIGATION OPPORTUNITIES

The potential non-potable irrigation demand areas were previously identified in the *2008 Non-Potable Water Study* and the May 2009 *Non-Potable Water Study,* they are summarized below (**Table 2-1**) and are shown on **Figure 2-1**.

Table 2-1 Estimated Irrigation Demands in Eastern Portion of JCSD

Irrigation Area Type	Demand (AF/YR)	Maximum Day Demand (gpm)
Existing Non-Potable Irrigation:		
Oak Quarry Golf Course	600.9	1,120
Nueva Vista Continuation	15.9	139
Loeb Ranch	Minimal	Minimal
Patriot High	105.4	659
Indian Hills Golf Course	475.3	500
Subtotal Existing	**1,197.5**	**2,418**
Potential Non-Potable Irrigation:		
Parks[1]	165.5	345
Schools[2]	121.0	252
Reverse Frontage[3]	26.0	87
Miscellaneous	39.5	84
Total Potential	**352.0**	**768**
Total Demand	**1,549.5**	**3,186**

[1] Assumed 80% of total park acreage will be irrigated

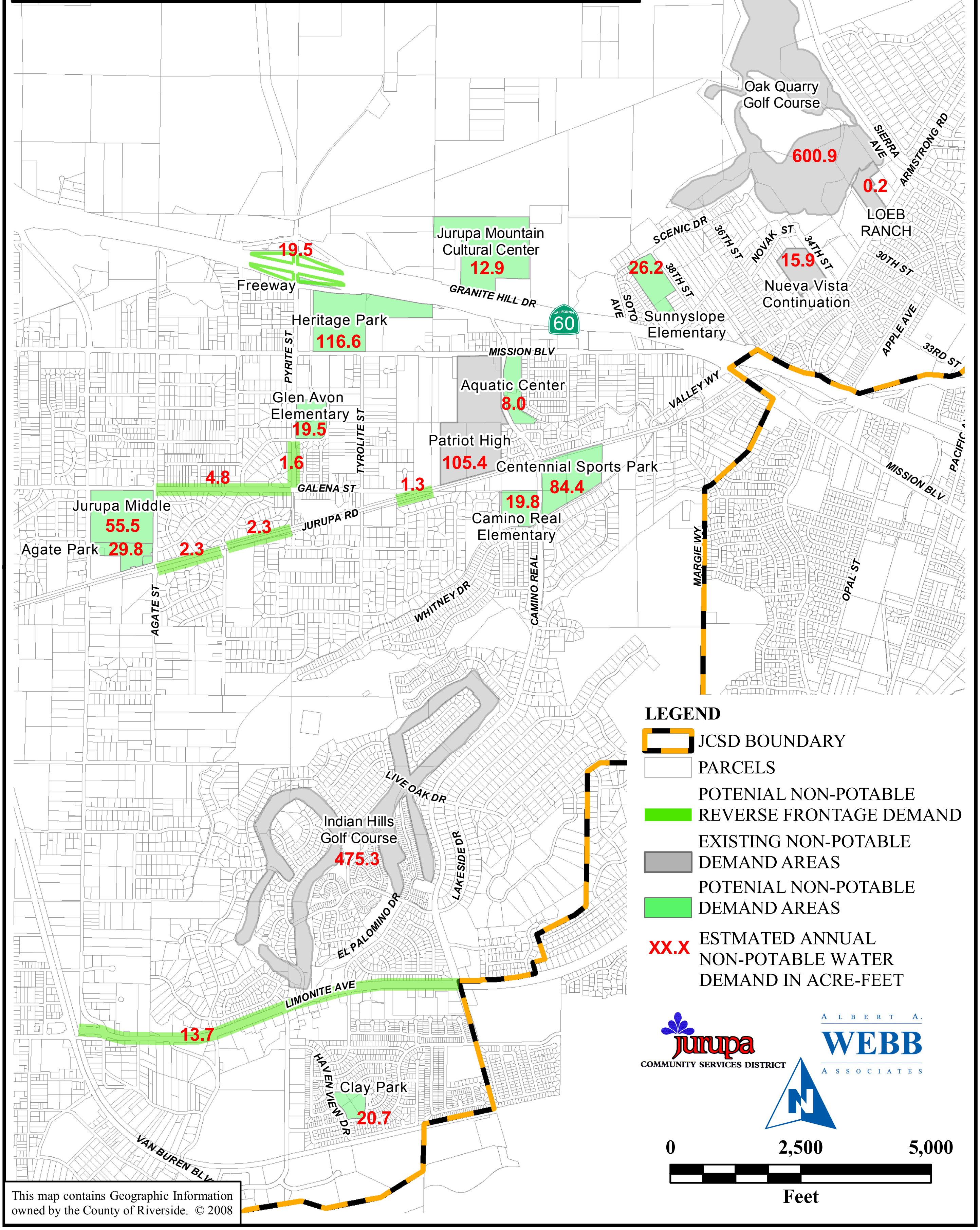
[2] Assumed 50% of total school acreage will be irrigated

[3] Assumed 75% of medians would be irrigated and all of the parkway minus the sidewalk

[4] Includes the Aquatic Center, Jurupa Mountain Cultural Center (12.0 AF/YR-**Appendix A**) and a portion of the Freeway right-of-way, as shown on **Figure 2-1**.

EXISTING AND POTENTIAL NON-POTABLE WATER DEMAND AREAS

FIGURE 2-1



Map revised June 30, 2010 G:\2010\10-00113\Gis\Figure 2-1.mxd

SECTION 3 - WATER SUPPLY & STORAGE

EMPIRE WATER

A portion of Empire Water's facilities (**Figure 1-1**) are within the study area of this report and include two groundwater wells located north of the 60 Freeway on Canal Street, the pipelines (18-inch and 24-inch) and tunnel connecting the wells to Indian Hills Golf Course (IHGC) and Patriot High School (PHS), and a booster station. Well No. 1 is designed to pump 300 gpm but is currently operated at 150 gpm due to drawdown of the water table during pumping. Well No. 2 can pump at its design flow rate of 700 gpm without drawdown problems. Therefore the total flow that can be relied on from these wells is approximately 850 gpm. Assuming these wells only operate at a usage rate of 65 percent on an annual basis, the estimated annual non-potable water production would be 891 ac-ft/yr. In 2008 the two wells produced 574 ac-ft of non-potable water, which was the highest annual production between the years 2005 to 2008.

Although Empire Water Company's Well Nos. 1 and 2 can meet the annual demand of IHGC and PHS, it does not appear that these two wells meet the maximum day water demands of IHGC and PHS[1]. The approximate irrigation area for the IHGC and PHS is 114.6 ac. Based on JCSD's approved landscape architects (Community Works Design Group) peak factor of 25 gpm/ac[2], the estimated peak flow for these two demand areas would be 2,865 gpm. In an 8 hour watering window these demands equate to 1.38 MG. Generally wells are designed to produce equal or greater than the maximum day demand. If the two wells were operated non-stop for a 24 hour period, the wells could produce only 1.22 MGD of non-potable water, therefore Empire Water's existing non-potable water supply sources cannot provide additional water supply for additional non-potable demands based upon Community Works Design Group's design criteria. Based upon existing irrigation conditions at the IHGC and PHS, there may be some additional water supply capacity from Wells Nos. 1 and 2 for a nominal expansion of the irrigated area.

[1] Chuck Cox, stated on July 7, 2010 that the existing two wells have adequate capacity to meet the maximum day water demands for IHGC and PHS based upon the conditions of the irrigated acres during peak water demand days during the summer.

[2] From Ted Young (Community Works Design Group) email of October 21, 2004 to Wally Franz (Albert A. Webb Associates)

A hydraulic analysis was conducted to quantify the capacity of Empire Water's gravity system (**Appendix B**). Based on as-built information provided by Empire Water, the 18 inch gravity line that serves PHS can flow approximately 1,500 gpm. According to the contract between PHS and Empire Water, the school can draw water from the system at a maximum flow rate of 550 gpm for 8 hours, which leaves an excess capacity in the 18 inch water line of 950 gpm (1,500 gpm – 550 gpm). The hydraulic calculations and plans for the 18 inch and 24 inch gravity line are provided in **Appendix B**.

JCSD WELL NO. 21

JCSD Well No. 21 is located on a 0.76 acre parcel between Florine Avenue and Apple Avenue, just south of 30th Street. The well can supply non-potable water to the Oak Quarry Golf Course, Loeb Ranch, and Nueva Vista. The well is designed to pump 1,240 gpm[1] at total dynamic head of 470 ft. Assuming this well only operated at a usage rate of 65 percent on an annual basis, the estimated annual non-potable water production would be 1300 ac-ft/yr. In 2008 the well produced 602 ac-ft of non-potable water, which was the highest annual production in the past five years (2005-2009).

Well No. 21 can meet the annual demand and maximum day demand of the Oak Quarry Golf Course, Loeb Ranch[2], and Nueva Vista. Based on JCSD's actual production data, Well No. 21 was able to meet the peak day demand of 1221 gpm for those three customers on July 21, 2009. Well No. 21 cannot provide additional water supply for additional non-potable demands beyond its current customers.

Also located at the Well No. 21 site is a second well (Well No. 5) that has a Nominal Design Capacity of 800 gpm and a Potential Production Capacity of 400 gpm. Well No. 5 is currently being used to irrigate the Oak Quarry Golf Course, along with potable water while Well No. 21 is out of operation. We do not know the impact on the combined production capacity of Well No. 21 and Well No. 5 if both wells are operated.

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[1] Data supplied (8/18/2010) by Todd Minten indicated that the Nominal Design capacity of Well No. 21 is 1,100 gpm and the Potential Production capacity of the well is 1,065 gpm.
[2] Loeb Ranch is projected to take less than 1 acre foot of non-potable water in 2010. It appears that Loeb Ranch has ceased irrigating their property.

INDIAN HILLS WASTEWATER TREATMENT PLANT SITE

The Indian Hills Wastewater Treatment Plant (WWTP), also known as Plant 2, was constructed in 1980 and is located on the north side of Limonite Ave near the entrance to the IHGC as shown on **Figure 1-2**. Wastewater from the Indian Hills area was treated at Plant 2 which produced tertiary effluent for irrigation use. The primary user of the treated water was the IHGC. In February 2006, JCSD decommissioned Plant 2 due to reported high operation and maintenance costs.

As part of this report, Albert A. Webb Associates, in conjunction with our wastewater sub-consultants AQUA Engineering, Inc., evaluated the potential cost of reactivating/reconstructing the plant to produce tertiary effluent for irrigation use **(Appendix C)**. Two alternatives were evaluated, which included conventional treatment and membrane bioreactor technology. The evaluation showed that the project cost of reconstructing a conventional 1.0 MGD plant would be $9.7 million compared to $11.4 million for a 1.0 MGD membrane bioreactor plant. JCSD would still utilize the City of Riverside to treat a portion of JCSD's wastewater, which currently totals 3.4 MGD. JCSD is projected to need an additional 1 MGD of wastewater treatment plant capacity to provide service to JCSD's original service area (excluding CFD No. 1 and the Eastvale Area). The cost of acquiring 1 MGD capacity from the City of Riverside was estimated at about $10.5 million[1]. Even though the cost of acquiring 1 MGD of additional treatment plant capacity at either Indian Hills or at the City of Riverside is comparable, there is a benefit of having a source of tertiary reclaimed water within JCSD's service area which can be used for irritation purposes.

RIVERSIDE REGIONAL WATER QUALITY CONTROL PLANT

Riverside's Regional Water Quality Control Plant (RWQCP) is located on the south side of the Santa Ana River just outside the District's boundary as shown on **Figure 1-1**. The RWQCP is capable of producing recycled water for irrigation purposes. It was assumed that the RWQCP has enough capacity to meet the District's existing and potential non-potable water demands within the District's boundaries studied in this report. It was also assumed that the RWQCP has

[1] City of Riverside Technical Advisory Committee Agenda, August 20, 2008

the pumping capacity to boost the recycled water to the proposed Indian Hills booster pump station.

SUNNYSLOPE RESERVOIR

Typically irrigation demands are high in the early morning and late evenings. To offset these peak demands, the use of storage facilities will be beneficial since it decreases the reliance upon peaking off the source of supply. An 11.8 MG reservoir, adjacent to the 3 MG Sunnyslope reservoir, has recently been completed and the Sunnlyslope reservoir could be retrofitted to store non-potable water. Based on pump and system information received from the District, Well No. 21 has the capacity to pump water to the Sunnyslope reservoir.

SECTION 4 - OPTIONS EVALUATED

Four ~~Three~~ options were evaluated as part of this study. Both Options 1 and 2 utilize groundwater from the Riverside South Groundwater Basin as the source of supply. Option 3 uses reclaimed water from the Indian Hill WWTP and Option 4 utilizes recycled water from the City of Riverside's RWQCP. All these options use the Sunnyslope reservoir for additional storage.

OPTION 1

Option 1 was based on re-equipping Well No. 5 to provide non-potable water for the additional irrigation demands shown in green on **Figure 1-2**. This option also utilizes JCSD's 3 MG Sunnyslope reservoir for storage of non-potable water to meet the potential non-potable irrigation demands discussed within this report. The required facilities would be as follows:

Additional JCSD Well

Re-equipping Well No. 5 to meet the estimated maximum day demands for the proposed irrigation areas previously discussed in Section 2. Well No. 21 is located on a 0.76 acre lot, along with Well No. 5. Further investigation would be required to determine the feasibility of operating Well Nos. 21 and 5. The estimated pumping capacity of Well No. 5 would need to be about 800 gpm to meet the additional irrigation demands.

Note that the existing pipeline between Well No. 21 and Nueva Vista Continuation School may also require replacement depending on available capacity and the condition of the pipe material.

Reach 1

Reach 1 would span between the existing 3 MG Sunnyslope reservoir and the Aquatic Center (**Figure 1-2**). From the Sunnyslope reservoir the water main would traverse south along the Sunnyslope access road to Granite Line. The water line would continue west along Granite Hill Drive to Camino Real which crosses under the 60 Freeway to the south. Continuing south along Camino Real the water main would terminate at Reach 4 near the Aquatic Center entrance or the PHS booster station for Option 2 as shown on **Figure 1-2**.

Reach 2

From the intersection of Camino Real and Mission Blvd, Reach 2 traverses west along Mission Boulevard to Heritage Park to supply non-potable water to both the park and the 60 Freeway ramps at Pyrite Street.

Reach 3

Commencing from the termination point of Reach 2 at Heritage Park, Reach 3 traverses west along Mission Boulevard to Pyrite Street then south along Pyrite Street to Galena Street. From the corner of Pyrite Street and Galena Street, Reach 3 continues west along Galena Street to Agate Street then south along Agate Street to connection for Agate Park and reverse frontage along Jurupa Road.

Reach 4

To supply non-potable water to Centennial Sports Park and Camino Real Elementary, Reach 4 is needed. Reach 4 commences from the Patriot High booster station and continues south along Camino Real to the south end of Centennial Sports Park.

Reach 5A

Reach 5A would span between Nueva Vista School, Sunnyslope Elementary, and to Reach 1 at the south end of the Sunnyslope Reservoir access road. From Nueva Vista's supply line from Well No. 21, Reach 5A traverses north along 34th Street to Novack Street. From the intersection of Novack Street and 34th Street, the line traverses west along Novack to 34th Street then north on 34th Street to Scenic Drive. From 34th Street and Scenic Drive the line traverses west along Scenic Drive which becomes Soto Street and terminates at Granite Hill Drive. At the corner of Soto Street and Granite Hill, the line continues west along Granite Hill to an access road to the Sunnyslope reservoir shown on **Figure 1-2**.

The estimated project cost for the proposed facilities required for Option 1 is provided in **Table 1-2**. Construction cost for each of the proposed facilities was determined by reviewing recorded bids of similar projects and engineering judgment. For a detailed breakdown of the construction and project cost for each of the proposed facilities in Option 1 and 2, refer to **Appendix D.**

Table 4-1 Option 1 Estimated Project Cost

Facility	Project Cost[1]
Reach 1	$900,000
Reach 2	$650,000
Reach 3	$1,230,000
Reach 4	$510,000
Reach 5A	$1,580,000
Sunnyslope Reservoir (Renovation)	$50,000
SCADA	$63,000
Well 21 Second Well	$700,000
Total	$5,683,000

[1]Project cost includes construction costs, construction contingencies, design engineering, including plans and specifications, design and construction surveying and mapping, geotechnical evaluation and report, engineering contract administration, and field inspection. Costs are based on Engineering News Record (ENR) Constructions Cost Index Los Angeles, July 2010 (ENR = 9968.69). Escalation, financing, interest during construction, District Contract Administration, legal, EIR/EIS, land acquisition, and R.O.W. agent costs are not included.
[2]Upgrade JCSD Well No. 5 or drill a second well.

OPTION 2

Option 2 is based on using Empire Water's existing distribution system to convey non-potable water from a new JCSD well and installing a new pump and motor at PHS's existing non-potable pump station site to pump water to JCSD's 3MG Sunnyslope reservoir for storage of non-potable water to meet the additional irrigation demands shown in green on **Figure 1-3.** Reaches 1-4 are the same as those outlined under Option 1.

JCSD Well No. 5

JCSD Well No. 5 is required to meet the estimated maximum day demands for the proposed irrigation areas previously discussed in Section 2. The estimated pumping capacity of a second well would need to be about 800 gpm to meet the additional irrigation demands. Further investigation would be needed to determine the feasibility of increasing the capacity of Well No. 5 to 800 gpm and not diminish the capacity of Well No. 21.

Reach 5B

Reach 5B commences from the Well No. 21 site and traverses south along Apple Avenue to 33rd Street. On 33rd Street Reach 5B continues east along 33rd Street to a sewer line easement that JCSD currently has through the lumber yard to the south. After crossing the lumber yard on the east side the proposed water line continues south and crosses a railroad spur which will require JCSD to obtain an easement. Reach 5B water main then ties into the existing Empire Water gravity lines after passing through a pressure reducing valve.

Reach 5C

Reach 5C will tie into Reach 1 at the intersection of the Sunnyslope reservoir access road and Granite Hill Drive then continue east along Granite Hill Drive to Soto Street. On Soto Street the line continues north to the north side of Sunnyslope Elementary.

Booster Station

The existing pumps at the Patriot High booster station cannot provide enough head to pump water to the existing Sunnyslope reservoir. The pumps would need to be replaced or a new booster station constructed to pump water to the Sunnyslope reservoir.

The estimated project cost for Option 2 is provided in Table 4-2.

Table 4-2 Option 2 Estimated Project Cost

Facility	Project Cost[1]
Reach 1-4	$3,290,000
Reach 5B	$490,000
Reach 5C	$560,000
Sunnyslope Reservoir (Renovation)	$50,000
SCADA	$63,000
Patriot High 2nd Booster	$280,000
Second Well at Well No. 21 Site	$700,000
Total	$5,433,000

[1]Project cost is 1.4 times construction cost rounded to nearest $10,000. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and basic environmental documentation. Costs are based on Engineering News Record (ENR) Escalation, financing, interest during construction, legal, land, R-O-W agent, and environmental impact report costs are not included

OPTION 3

Option 3 is based on reconstructing the Indian Hills WWTP to provide recycled water for irrigation purposes at the IHGC, thereby freeing up Empire Water's system to serve other potential non-potable irrigation areas. Reach 1 through 4 are the same as the other two options and Reach 5B ~~(smaller diameter)~~ and 5C is the same as Option 2. Like the other two options, Option 3 also utilizes the Sunnyslope reservoir for storage. An additional pipeline reach will be required to connect the WWTP to the IHGC reservoir, as shown in **Figure 1-4**.

Reach 6

Reach 6 is needed to supply reclaimed water from the proposed Indian Hills WWTP to the IHGC reservoir. From the Indian Hills WWTP the pipeline would traverse north through the golf course property and up the hill to the golf course reservoir following the same alignment of the original pipeline from the WWTP.

Indian Hills WWTP Booster Station

A new booster station would be required if the proposed Indian Hills WWTP is to provide reclaimed water to the IHGC. The pumps would be needed to boost reclaimed water to the IHGC reservoir located on top of the hill north of the golf course as shown on **Figure 1-4**.

Note that although a 1 MGD WWTP will produce approximately 700 gpm on average which would meet the estimated annual demand for the proposed irrigation areas, additional supply (approximately 200 gpm) will be needed for maximum day demand. JCSD could meet the maximum day demands by utilizing Well No. 5. It would also be feasible to intertie the system into Empire Water's system. It would be feasible to supply IHGC with reclaimed water and use Empire Water's system to supply irrigated water to the balance of the potential non-potable service area currently being served by potable water for irrigation purposes.

The estimated project cost for Option 3 is provided in **Table 4-3**. It should be noted that the estimated project cost for Option 3 does not include the potential purchase cost of the Empire Water System by JCSD or reconstructing the Indian Hills WWTP.

Table 4-3 Option 3 Estimated Project Cost

Facility	Project Cost[1]
Reach 1-4	$3,290,000
Reach 5B	$490,000
Reach 5C	$560,000
Reach 6	$1,090,000
Upgrade Well No. 5	$150,000
Sunnyslope Reservoir (Renovation)	$50,000
SCADA	$63,000
Indian Hills WWTP Booster	$580,000
Total	$6,273,000

[1] Project cost includes construction costs, construction contingencies, design engineering, including plans and specifications, design and construction surveying and mapping, geotechnical evaluation and report, engineering contract administration, and field inspection. Costs are based on Engineering News Record (ENR) Constructions Cost Index Los Angeles, July 2010 (ENR = 9968.69). Escalation, financing, interest during construction, District Contract Administration, legal, EIR/EIS, land acquisition, and R.O.W. agent costs are not included.

OPTION 4

Option 4 is based on utilizing recycled water from Riverside's RWQCP, thereby freeing up groundwater from the Riverside Groundwater Basin for potable water purposes. Also included in this option are the irrigation demands from Patriot High School and the Indian Hills Golf Course that are currently being met with non-potable well water from Empire Water. The facilities needed for this option are Reach 1 through 4, Reach 5A (larger size), Reach 6, the Sunnyslope Reservoir, and the Indian Hills WWTP Booster Station. These facilities are the same as previously described in Options 1 through 3 except for the Indian Hills WWTP Booster Station which will need to be much larger than proposed for Option 3. An, additional two more pipe reaches will be needed as described below (**Figure 1-5**).

Indian Hills WWTP Booster Station

A new booster station would be required for adequate system pressure and to boost recycled water coming from Riverside's RWQCP to the Sunnyslope and Indian Hills Reservoirs. The pumps should be capable of pumping at an estimated flow rate of 3000 gpm.

Reach 7

Reach 7 is needed for additional supply of non-potable water to the north end of the District's boundary. From the Indian Hills Booster Station the pipeline would traverse east along the pump station access road to El Palomino Drive, then north along El Palomino drive to Lakeside Drive. At the corner of Lakeside Drive and Camino Real, the line continues north along Camino Real to the tie-in with Reach 4.

Reach 8

Reach 8 connects Riverside's RWQCP to the proposed Indian Hills Booster Station. Commencing from the RWQCP, Reach 8 could cross the Santa Ana River by utilizing the District's third barrel river crossing. The pipeline would continue north along Haven View Dr. and El Palomino Dr. to the proposed Indian Hills WWTP Booster Station as shown on **Figure 1-5**.

Note that the existing pipeline between Nueva Vista Continuation School and the Oak Quarry Golf Course will likely require replacement depending on the available capacity and the condition of the pipe material.

The estimated project cost for Option 4 is provided in Table 4-4.

Table 4-4 Option 4 Estimated Project Cost

Facility	Project Cost[1]
Reach 1-4	$3,480,000
Reach 5C	$650,000
Reach 6	$1,090,000
Reach 7	$2,750,000
Reach 8	$1,620,000
Sunnyslope Reservoir (Renovation)	$50,000
SCADA	$63,000
Indian Hills WWTP Booster	$750,000
Total	$10,453,000

[1] Project cost includes construction costs, construction contingencies, design engineering, including plans and specifications, design and construction surveying and mapping, geotechnical evaluation and report, engineering contract administration, and field inspection. Costs are based on Engineering News Record (ENR) Constructions Cost Index Los Angeles, July 2010 (ENR = 9968.69). Escalation, financing, interest during construction, District Contract Administration, legal, EIR/EIS, land acquisition, and R.O.W. agent costs are not included.

SECTION 5 - POTENTIAL POTABLE WATER SAVINGS

Currently JCSD does not provide irrigation water to reverse frontage or freeway ramp areas within the study area of this report. However, the schools and parks use potable water for irrigation purposes with the exception of PHS which receives its irrigation water supply from Empire Water. Furthermore, Centennial Sports Park has not been constructed, and the Aquatic Center is under construction as of November 2010. As a result of implementing the proposed options previously described in Section 4, JCSD could potentially save 247 acre-foot per year by providing non-potable water to the existing irrigation areas, and save potentially 352 acre-foot per year when the future irrigation areas are developed, as shown in **Table 5-1**.

Table 5-1 Estimated Annual Savings of Potable Water Supply by Converting to Non-Potable Supply

Irrigation Area Type	Existing Savings (AF/YR)	Future Savings (AF/YR)
Parks		
Agate Park	35.7	35.7
Centennial Sports Park		52.0
Heritage Park	52.0	52.0
Clay Park	25.8	25.8
Schools		
Jurupa Middle School	55.5	55.5
Camino Real Elementary	19.8	19.8
Glen Avon Elementary	19.5	19.5
Sunnyslope Elementary	26.2	26.2
Miscellaneous		
60 Freeway		19.5
Aquatic Center		8.0
Jurupa Mountain Cultural Center	12.0	12.0
Reverse Frontage		26.0
Total Demand	246.5	352.0

Provided in Table 5-2 is a summary of each of the options and the proposed water supply types used to meet the estimated annual demands for each of the irrigation areas studied in this report. As shown on in Table 5-2, Options 1 through 3 rely primarily on well water from the Riverside Groundwater Basin for irrigation supply whereas Option 4 utilizes recycled water from Riversides RWQCP.

Table 5-2 Source Water Supply per Option

Irrigation Area Type	Annual Demand	Proposed Water Supply Type[1]			
Miscellaneous	AF/Y	Option 1	Option 2	Option 3	Option 4
Oak Quarry Golf Course	600.92	Well	Well	Well	Recycled
Indian Hills Golf Course	475.3	Empire Water	Well	Recycled	Recycled
Loeb Ranch	Minimal	Well	Well	Well	Recycled
60 Freeway	19.5	Well	Well	Well	Recycled
Aquatic Center	8	Well	Well	Well	Recycled
Jurupa Mountain Cultural Center	12	Well	Well	Well	Recycled
Parks					
Agate Park	35.7	Well	Well	Well	Recycled
Clay Park	25.8	Potable	Potable	Potable	Recycled
Centennial Sports Park	52	Well	Well	Well	Recycled
Heritage Park	52	Well	Well	Well	Recycled
Schools					
Jurupa Middle School	55.5	Well	Well	Well	Recycled
Camino Real Elementary	19.8	Well	Well	Well	Recycled
Glen Avon Elementary	19.5	Well	Well	Well	Recycled
Sunnyslope Elementary	26.2	Well	Well	Well	Recycled
Patriot High	105.4	Empire Water	Well	Well	Recycled
Nueva Vista Continuation	15.9	Well	Well	Well	Recycled
Reverse Frontage					
90	13.7	Potable	Potable	Recycled	Recycled
91	2.3	Well	Well	Well	Recycled
92	2.3	Well	Well	Well	Recycled
93	4.8	Well	Well	Well	Recycled
94	1.6	Well	Well	Well	Recycled
95	1.3	Well	Well	Well	Recycled
Empire Water Well Water Supply		580.7	0.0	0.0	0.0
JCSD: Potable Water Supply		39.5	39.5	25.8	0.0
Well Water Supply		929.3	1510.0	1034.7	0.0
Recycled Water Supply		0.0	0.0	489.0	1549.5

[1] Water supplied by "Empire Water" and "Well" for each option comes from the Riverside Groundwater Basin

SECTION 6 -FINDINGS, CONCLUSIONS, & RECOMMENDATIONS

The objectives of this study were to perform an evaluation of Empire Water's facilities, quantify the existing and potential demands for non-potable irrigation water in the eastern portion of JCSD, identify viable sources of non-potable supply, and layout a backbone infrastructure capable of distributing non-potable water throughout the study area.

FINDINGS

The findings from this report are discussed below:

NON-POTABLE IRRIGATION OPPORTUNITIES

Potential non-potable irrigation demands evaluated included schools, parks, reverse frontage, and large miscellaneous facilities. The total potential non-potable irrigation demands within JCSD's eastern boundary are approximately 352 AF/YR. A summary of potential non-potable irrigation opportunities are provided in the table below:

Irrigation Area Type	Irrigation Demand (AF/YR)
Existing Non-Potable Irrigation	
Oak Quarry Golf Course	600.9
Nueva Vista Continuation	15.9
Loeb Ranch	Minimal
Patriot High	105.4
Indian Hills Golf Course	475.3
Subtotal Existing	1,197.5
Potential Non-Potable Irrigation	
Parks	165.5
Schools	121.0
Reverse Frontage	26.0
Miscellaneous[1]	39.5
Subtotal Potential	352.0
Total Demand	1,549.5

[1] Includes the Aquatic Center, Jurupa Mountain Cultural Center (12.0 AF/YR – **Appendix A**), Loeb Ranch, and a portion of the 60 Freeway right-of-way, as shown on **Figure 3-1**.

POTENTIAL NON-POTABLE WATER SUPPLY SOURCES

Of the potential sources evaluated, it was found that JCSD has ~~two~~ three potential sources of additional non-potable water for use in the eastern portion of the service area. Ground water from the Riverside South Groundwater Basin (where Well Nos. 21 and 5 are located)~~, and~~ reclaimed water from the proposed reconstructed Indian Hills WWTP, and reclaimed water from Riverside's RWQCP. Options 1 and 2 require re-equipping Well No. 5 for additional supply of non-potable water. Option 3 was based on the assumption that the Indian Hills WWTP would be reconstructed, with a booster station and a pipeline from the reconstructed plant to the Indian Hills storage reservoir in the Pedley Hills (**Figure 1-4**). In addition, Option 3 requires the use of Well No. 5. Option 4 utilizes recycled water from Riverside's RWQCP as the sole provider of non-potable water for the irrigation areas studied in this report.

EMPIRE WATER

According to Empire Water, the total flow that can be relied on from the wells is approximately 850 gpm. The estimated annual non-potable water production from these wells is 891 ac-ft/yr. In 2008 the two wells produced 574 ac-ft of non-potable water, which was the highest annual production between the years 2005-2008.

Empire Water's two wells can produce 1.22 MGD, which is less than the estimated demand based on the peak factors used in this report. However, according to Chuck Cox, peak day water demands at the IHGC and PHS are currently being met. Therefore, it is questionable if there is additional non-potable water supply from Empire Water's existing two wells that could be utilized for irrigation by JCSD under existing conditions.

A hydraulic analysis was conducted to quantify the capacity of Empire Water's gravity system westerly of Empire Water Well Nos. 1 and 2. Based on as-built information provided by Empire Water, the 18 inch gravity line that serves PHS can flow approximately 1,500 gpm. According to the contract between PHS and Empire Water, the school can draw water from the system at a maximum flow rate of 550 gpm for 8 hours, which leaves an excess capacity in the 18 inch water line of 950 gpm (1,500 gpm minus 550 gpm).

WELL NO. 21

Well No. 21 is owned by JCSD and located on a 0.76 acre parcel between Florine Avenue and Apple Avenue, just south of 30th Street. The well can supply non-potable water to the Oak Quarry Golf Course, Loeb Ranch, and Nueva Vista. The well is designed to pump 1,240 gpm at total dynamic head of 470 ft. Assuming this well only operated at a usage rate of 65 percent on an annual basis, the estimated annual non-potable water production would be 1300 ac-ft/yr. In 2008 the well produced 602 ac-ft of non-potable water, which was the highest annual production in the past four years (2006-2009).

Well No. 21 can meet the annual demand and maximum day demand of the Oak Quarry Golf Course, Loeb Ranch[1], and Nueva Vista. Based on JCSD's actual production data, Well No. 21 was able to meet the peak day demand of 1221 gpm for those three customers on July 21, 2009. Well No. 21 cannot provide additional water supply for additional non-potable water demands beyond its current customers.

Well No. 5 is also located on the same site as Well No. 21 and Well No. 5 has a potential production capacity of 400 gpm.

INDIAN HILLS WWTP

The Indian Hills WWTP, also known as Plant 2, was constructed in 1980 and is located on the north side of Limonite Ave near the entrance to the IHGC. In February 2006, JCSD decommissioned Plant 2 due to reported high operation and maintenance costs. Two alternatives were evaluated, which included conventional treatment and membrane bioreactor technology. The evaluation showed that the project cost of reconstructing a conventional 1.0 MGD plant would be $9.7 million compared to $11.4 million for a 1.0 MGD membrane bioreactor plant. The new plant would provide approximately 1.0 MGD of tertiary reclaimed water within JCSD's service boundary. It is suggested that the Indian Hills WWTP supply irrigation water to the IHGC and the Empire Water System be used to supply PHS and the balance of the potential non-potable water service area. This would require a well capacity of about 1,050 gpm which is 200 gpm more than Empire Water's capacity of Well Nos. 1 and 2. Therefore, for this alternative to be feasible, JCSD could meet the maximum day demands by utilizing Well No. 5.

[1] Loeb Ranch is projected to take less than 1 acre foot of non-potable water in 2010.

RIVERSIDE'S RWQCP

Riverside's Regional Water Quality Control Plant (RWQCP) is located on the south side of the Santa Ana River just outside the District's boundary as shown on **Figure 1-1**. The RWQCP is capable of producing recycled water for irrigation purposes. It was assumed that the RWQCP has enough capacity to meet the District's existing and potential non-potable water demands within the District's boundaries studied in this report. It was also assumed that the RWQCP has the pumping capacity to boost the recycled water to the proposed Indian Hills WWTP Booster Station.

CONCLUSIONS

An additional water supply is required to meet the estimated maximum day demands for the proposed irrigation areas previously discussed in Section 2. Further investigation would be required to determine the feasibility of re-equipping Well No. 5 to produce 800 gpm and determine the potential interference with Well 21.

Reconstructing the Indian Hills WWTP to treat 1.0 MGD would provide approximately 700 gpm of tertiary reclaimed water for irrigation purposes which would meet the estimated annual demand for the proposed irrigation areas, additional supply (approximately 200 gpm) will be needed for maximum day demand. JCSD could meet the maximum day demands by utilizing Well No. 5 to provide the additional 200 gpm. The impact of pumping Well No. 5 at 200 gpm on the capacity of JCSD Well No. 21 needs to be determined.

Of the potential sources evaluated in this report, it was found that Option 2 is the most economical option which would decrease the potable water demands and increase the non-potable demands in the eastern portion of JCSD's boundary area. Option 2 will meet the estimated maximum day demands for the potential non-potable irrigation demands discussed within this report (excluding Clay Park and Limonite Ave due to their distance from a non-potable supply source). However, Option 3 is also considered to be feasible to meet the projected additional 1.0 MGD of wastewater treatment plant capacity necessary to provide service to JCSD's original service area (excluding CFD No. 1 and the Eastvale Area). Even though the cost of acquiring 1.0 MGD of additional treatment plant capacity at either Indian Hills or at the City of Riverside is comparable, there is a benefit of having a source of tertiary reclaimed water within JCSD's service area which can be used for irritation purposes. The advantage to Option 4 is the ability this option provides to free up ground water from the Riverside Groundwater Basin by using recycled water from Riversides RWQCP that would otherwise be disposed of in the Santa Ana River. As shown in Table 5-2, Option 4 would save approximately 1550 af/yr of future groundwater used for irrigation by offsetting the well water with recycle water.

RECOMMENDATIONS

As the population within JCSD's service area increases, so will the need for potable water, non-potable water, and wastewater treatment capacity. It is recommended that JCSD further evaluate Options ~~2 and 3~~ 4 because this option provides opportunities to free up groundwater that can potentially be used for potable water purposes. ~~Further investigation of the Riverside South Groundwater Basin should be undertaken in the area of JCSD's Well Nos. 21 and 5 to determine if increasing the production capacity of Well No. 5 to 800 gpm would adversely impact Well No. 21's production.~~ ~~JCSD should also begin negotiations with Empire Water regarding the use of their existing conveyance system as discussed in Option 2 and potential sale of the system to JCSD as indicated in Option 3.~~ ~~Additionally JCSD should conduct further investigation into Option 3 by evaluating the cost and benefits of reconstructing the Indian Hills WWTP.~~ JCSD should begin discussions with Empire Water, as Option 4 proposes supplying two of Empire Water's customers (PHS and IHGC) with an alternative water source of supply. Furthermore, JCSD will need to begin discussions with the City of Riverside to determine the quantity of recycled water available from Riverside's RWQCP and the pumping ability of the plant to meet JCSD's pressure and demands requirements.

APPENDIX A

Estimated Irrigation Demands

Table A-1 Existing and Potential Maximum Day Irrigation Water Demand in Gallons per Minute in the Eastern Portion of JCSD

Irrigation Area Type	Irrigation Demand (gpm)[1]	
Existing Non-Potable Irrigation	**Maximum Day Demand**	**Peak Hour Demand**
Oak Quarry Golf Course[6]	1,120	1,120
Nueva Vista Continuation	46	139
Loeb Ranch	Minimal	Minimal
Patriot High (Empire Water)	220	659
Indian Hills Golf Course (Empire Water)[6]	500	500
Subtotal Existing	**1,886**	**2,418**
Potential Non-Potable Irrigation	**Maximum Day Demand**	**Peak Hour Demand**
Parks[2] (Table A-4)	345	1,034
Schools[3] (Table A-5)	252	757
Reverse Frontage[4] (Table A-6)	87	260
Miscellaneous	84	252
Total Potential[5]	768	2,303
Total Demand	2,654	4,721

[1]Based on Community Design Works flow rate estimate of 40 gpm/ac for reverse frontage areas and 25 gpm/ac for other areas during an 8 hour watering window, 5 days a week (1 day maintenance and 1 day for play).
[2]Assumed 80% of total park acreage will be irrigated
[3]Assumed 50% of total school acreage will be irrigated
[4]Assumed 75% of medians would be irrigated and all of the parkway minus the sidewalk
[5]With the renovation of the Sunnyslope 3MG Reservoir a peak flow of 860 gpm will suffice for a 24 hour period.
[6] Has a reservoir, therefore the peak hour was assumed to be the same as the maximum day demand

Table A-2 Existing and Potential Annual Irrigation Water Demand in Acre Feet per Year in the Eastern Portion of JCSD

Irrigation Area Type	Irrigation Demand (AF/YR)[1]
Existing Non-Potable Irrigation	
Oak Quarry Golf Course	600.9
Nueva Vista Continuation	15.9
Loeb Ranch	Minimal
Patriot High (Empire Water)	659.0
Indian Hills Golf Course (Empire Water)	475.3
Subtotal Existing	1,751.1
Potential Non-Potable Irrigation	
Parks[2]	165.5
Schools[3]	121.0
Reverse Frontage[4]	26.0
Miscellaneous	39.5
Subtotal Potential	352.0
Total Demand	2,103.1

[1]Assumed 4 ac-ft/acre/year based on phone conversation with the District (Ric Welch) on 6-14-07
[2]Assumed 80% of total park acreage will be irrigated
[3]Assumed 50% of total school acreage will be irrigated
[4]Assumed 75% of medians would be irrigated and all of the parkway minus the sidewalk

TABLE A-3
POTENIAL MISCELLANEOUS
NON-POTABLE IRRIGATION DEMANDS

	Area	Annual Demand	Design Flow Rate
Irrigation Area Type	Irrigated Area (AC)	AF/Y (1)	Flow (gpm)(2)
60 Freeway	4.9	19.5	122
Aquatic Center (3)	2.0 (3)	8.0	50
Jurupa Mountain Cultural Center	12.0	12.0 (4)	80 (5)
Total:	**18.9**	**39.5**	**252**

[1] Assumed use per irrigated area 4 ac-ft/ac unless specified otherwise.

[2] Based on Community Design Works flow rate estimate of 25 gpm/ac for an 8 hour watering window, 5 days a week

[3] From review of tentative planning exhibits is was assumed that approximately 2 ac of land could utilize non-potable irrigation water.

[4] Assumed 1 ft/yr of water due to drought resistant plants (see page A-6 in Appendix A).

[5] Based on 20% annual demand for maximum month, max day is 1.5 times average day of max month, and water use over an 8 hour period.

TABLE A-4
POTENTIAL PARK NON-POTABLE IRRIGATION DEMANDS

	Area	Annual Demand	Design Flow Rate
Park ID	Irrigated Area[(1)] (AC)	AF/Y [(2)]	Flow (gpm)[(3)]
Agate Park	8.9	35.7	223
Clay Park	6.5	25.8	161
Centennial Sports Park	13.0	52.0	325
Heritage Park	13.0	52.0	325
Total:	41.4	165.5	1,034

[1] Base on irrigation acreage provided by Dan Rodriguez, General Manager for Jurupa Area Recreation and Parks District

[2]Assumed use per irrigated area 4 ac-ft/ac

[3]Based on Community Design Works flow rate estimate of 25 gpm/ac for an 8 hour watering window, 5 days a week (1 day maintenance and 1 day for play).

TABLE A-5
POTENTIAL SCHOOL NON-POTABLE IRRIGATION DEMANDS

	Area	Annual Demand	Design Flow Rate
School ID	**Irrigated Area[(1)] (AC)**	**AF/Y [(2)]**	**Flow (gpm)[(3)]**
Jurupa Middle School	13.9	55.5	347
Camino Real Elementary	5.0	19.8	124
Glen Avon Elementary	4.9	19.5	122
Sunnyslope Elementary	6.5	26.2	164
Total:	30.2	121.0	757

[1] Assumed 50% of total school acreage will be irrigated.

[2] Assumed 4 ac-ft/ac based on District direction

[3] Based on Community Design Works flow rate estimate of 25 gpm/ac for an 8 hour watering window, 5 days a week (1 day maintenance and 1 day for play) unless noted otherwise.

[4] Patriot High School's 2008 production was 99.0 AF/Y, used the pump design flow rate of 400 gpm

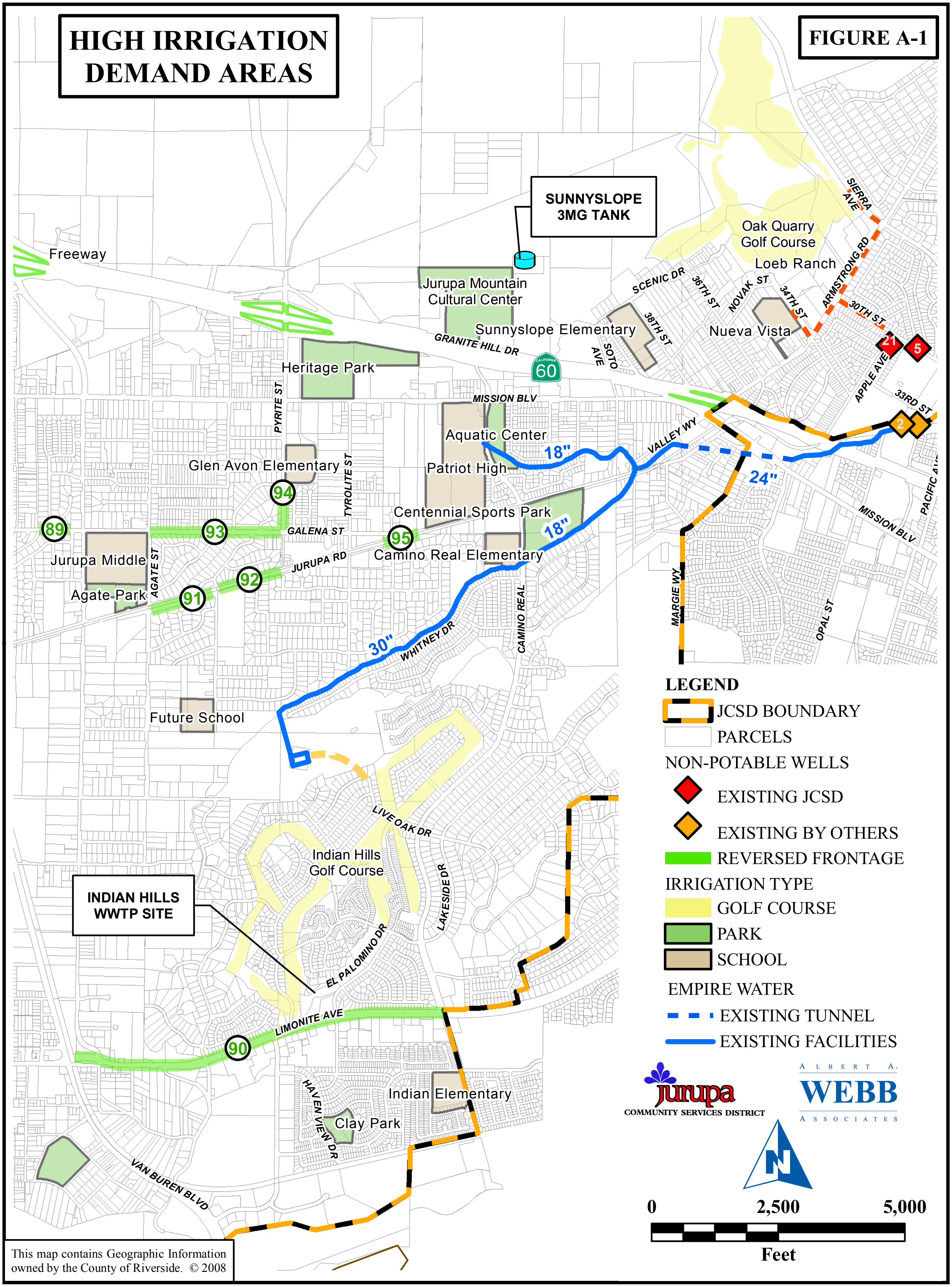
TABLE A-6
POTENIAL REVERSE FRONTAGE
NON-POTABLE IRRIGATION DEMANDS

	Area	Annual Demand	Design Flow Rate
Rev. Frontage ID (Figure A-1)	Irrigated Area[1] (AC)	AF/Y [2]	Flow (gpm)[3]
90	3.43	13.7	137
91	0.58	2.3	23
92	0.59	2.3	23
93	1.19	4.8	48
94	0.40	1.6	16
95	0.33	1.3	13
Total:	6.52	26.0	260

1 Assumed 75% of Medians would be irrigated, see Attachment A for locations

2 Assumed use per irrigated area 4 ac-ft/acre

3 Based on Community Design Works flow rate estimate of 40 gpm/ac for an 8 hour watering window



Map revised July 1, 2010 G:\2010\10-0113\Gis\Figure A-1.mxd

APPENDIX B

Empire Water Gravity Pipeline & Hydraulic Analysis

Appendix B
Empire Water Gravity Line
Flow Capacity

National Clay Pipe Institute
HYFLO

Open Channel Hydraulic Program
Calculate Quantity

Pipe Diameter:	18
Pipe Slope:	0.001
Coefficient of Friction (n):	0.013

Percent of Pipe Dia.	Depth of Liq (in)	Velocity (fps)	Quantity (cfs)	Quantity (gpm)	Quantity (MGD)
20	3.6	1.17	0.29	132.0	0.190
30	5.4	1.47	0.66	294.6	0.424
40	7.2	1.71	1.13	506.2	0.729
50	9.0	1.89	1.67	750.3	1.080
60	10.8	2.03	2.24	1007.5	1.451
70	12.6	2.12	2.80	1254.9	1.807
75	13.5	2.14	3.05	1366.6	1.968
80	14.4	2.15	3.26	1464.9	2.109
85	15.3	2.15	3.44	1544.3	2.224
90	16.2	2.12	3.56	1597.4	2.300
95	17.1	2.07	3.59	1610.9	2.320
100	18.0	1.89	3.34	1500.6	2.161

Pipe Diameter:	24
Pipe Slope:	0.001
Coefficient of Friction (n):	0.013

Percent of Pipe Dia.	Depth of Liq (in)	Velocity (fps)	Quantity (cfs)	Quantity (gpm)	Quantity (MGD)
20	4.8	1.41	0.63	283.8	0.409
30	7.2	1.78	1.41	633.3	0.912
40	9.6	2.07	2.42	1088.1	1.567
50	12.0	2.29	3.59	1612.8	2.322
60	14.4	2.45	4.83	2165.5	3.118
70	16.8	2.56	6.01	2697.5	3.884
75	18.0	2.59	6.55	2937.6	4.230
80	19.2	2.60	7.02	3148.7	4.534
85	20.4	2.60	7.40	3319.4	4.780
90	21.6	2.57	7.65	3433.7	4.945
95	22.8	2.50	7.72	3462.7	4.986
100	24.0	2.29	7.19	3225.5	4.645

APPENDIX C

Indian Hills WWTP Upgrade Analysis

The following provides a brief description of the upgrades proposed for the Indian Hills WWTP:

OPTION #1 – OXIDATION DITCH UPGRADE, 1.0 MGD

1. Re-equip the headworks lift station – The existing screw pump station, which raises the influent wastewater so it can flow by gravity through the treatment processes, requires improvements. The equipment, gates and screw pumps, will need to be replaced and the concrete structures may also require some rehabilitation to provide for a 20-year design life.

2. Install new screening equipment – The headworks channels are still in tact, but new screening equipment is required as the first part of treatment. Fine screening equipment is recommended that will remove all debris larger than ¼” in size. This removes rags and other deleterious material that can impact the downstream treatment processes, pumps or other equipment, and the final effluent. It is anticipated that two (2) complete screens will be installed to provide duty and standby operation for this process.

3. Rehabilitate oxidation ditch with new aeration and mixing – The oxidation ditch concrete is intact but all of the ancillary equipment has been removed. Thus, new aeration equipment and mixers will be installed in the ditch and the influent and effluent structures will be rehabilitated with necessary gates and valves to allow for proper operations. The aeration equipment will include fine bubble diffusers, which considering the 12’ water depth in the ditch, is the most efficient form of transferring oxygen into the process. The diffusers will require the installation of blowers to provide process air, which are discussed in item #9. The mixers will be low speed mixers providing the needed velocity in the ditch.

4. Provide and install new secondary clarifier mechanisms and construct one additional secondary clarifier – The existing 35’ diameter clarifiers will require new mechanisms along with recycle and waste pumps. An additional 35’ diameter clarifier will be required to meet the 1.0 mgd design flow to ensure the clarifier process is not overloaded. Thus, three (3) total clarifiers will be made operable for this upgrade.

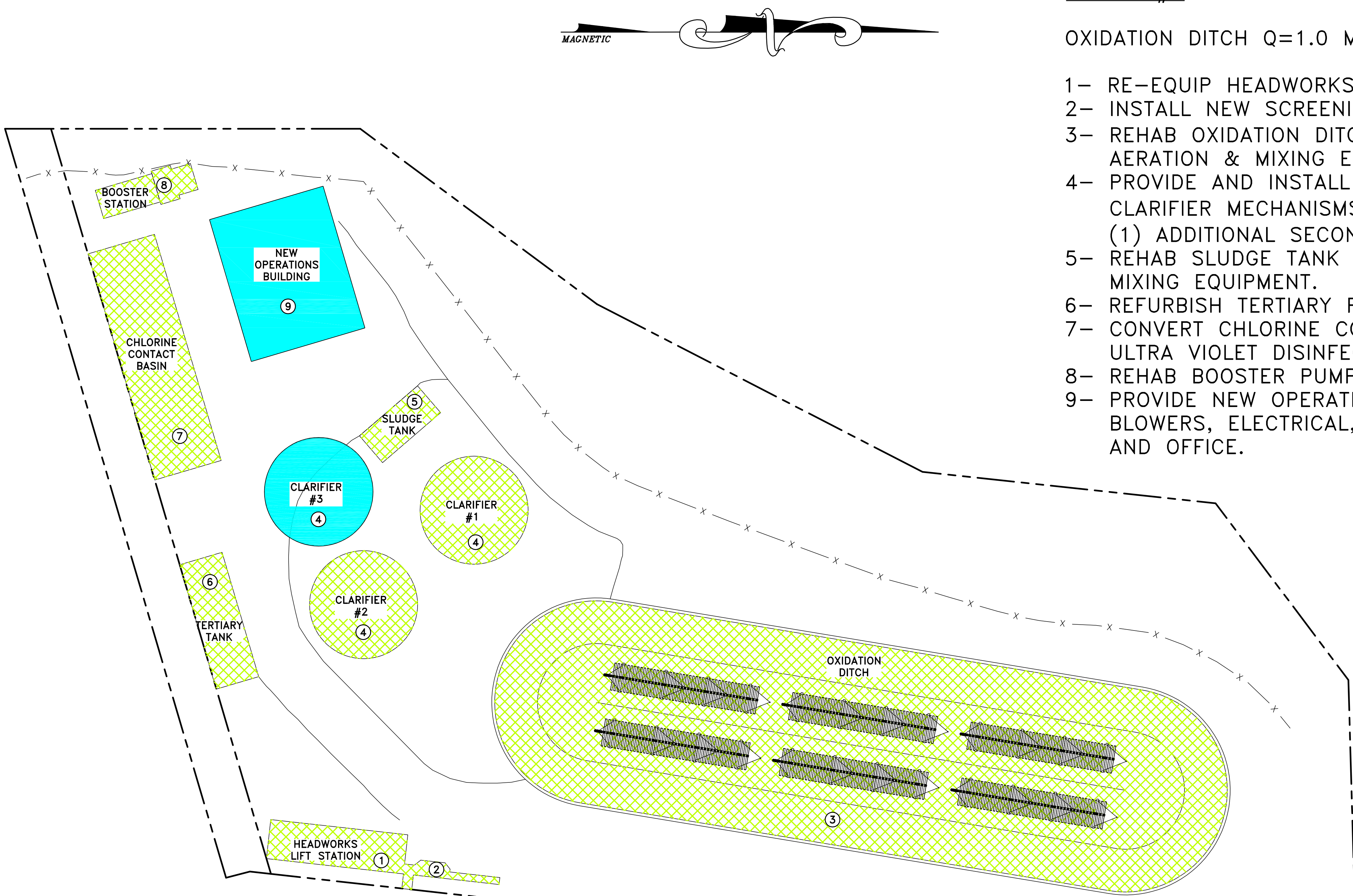
5. Rehabilitate sludge tank aeration/mixing equipment – The sludge tank will receive waste sludge and scum. Air diffusers will be installed in the tank and process air will be provided by the blowers described in item #9.

6. Refurbish tertiary filtration equipment – Cloth filters will be installed to provide tertiary filtration of the effluent. These filters will either be installed in prefabricated steel tanks or in cast-in-place concrete tanks.

7. Convert chlorine contact basin to ultra violet disinfection – The chlorine contact basin will be modified to provide a channel, covered with planking, where ultra violet disinfection equipment will be installed. Some modifications to the existing basin along with additional gates and weirs will be required.

8. Rehabilitate booster pump station – New pumps and piping will be installed to provide for effluent pumping requirements. This can be installed in the existing effluent booster wet well.

9. Provide new operations building – A building will be constructed on site to house the process blowers, electrical gear, solids handling process, lab, and office. This blowers will be high efficiency turbo blowers and will provide air mainly to the oxidation ditch and the sludge holding tank. The solids handling process will include dewatering equipment, like a screw or belt press, that will dewater the wasted solids to about 16%. The solids will then be conveyed to a haul off unit or truck to be hauled off site for disposal. An electrical room will be provided to house the MCCs, PLC panels, and other electrical equipment. A lab and office will be provided for operational uses.



LEGEND

REFURBISHED STRUCTURES:

NEW STRUCTURES:

OPTION #1

OXIDATION DITCH Q=1.0 MGD

1– RE–EQUIP HEADWORKS LIFT STATION.
2– INSTALL NEW SCREENING EQUIPMENT.
3– REHAB OXIDATION DITCH W/NEW AERATION & MIXING EQUIPMENT.
4– PROVIDE AND INSTALL NEW SECONDARY CLARIFIER MECHANISMS (2) AND CONSTRUCT (1) ADDITIONAL SECONDARY CLARIFIER.
5– REHAB SLUDGE TANK AERATION MIXING EQUIPMENT.
6– REFURBISH TERTIARY FILTRATION EQUIPMENT.
7– CONVERT CHLORINE CONTACT BASIN TO ULTRA VIOLET DISINFECTION.
8– REHAB BOOSTER PUMP STATION.
9– PROVIDE NEW OPERATIONS BUILDING WITH BLOWERS, ELECTRICAL, SOLIDS HANDLING, AND OFFICE.

0 1/2 1

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

KRB 08/13/2010 X:\Indian Hills\1drawings\site base.dwg

AQUA ENGINEERING, INC.
533 W. 2600 S., SUITE 275 BOUNTIFUL, UT 84010
PHONE (801) 299-1327 FAX (801) 299-0153

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PLANS PREPARED UNDER THE SUPERVISION OF:
BRIAN P. KNOLL
REGISTERED CIVIL ENGINEER NO. C65690
REGISTRATION EXPIRES 9/30/07
DATE

INDIAN HILLS
WATER RECLAMATION FACILITY UPGRADE
PROPOSAL
OPTION #1

ORIGINAL				
NO.	DATE	DESIGN	DRAWN	CHECKED
0	–	–	–	–

REVISIONS

SHEET

Oxidation Ditch Rehabilitation - 1.0 MGD

	ITEM	UNIT	QUANTITY	UNIT PRICE	SUBTOTAL	TOTAL
1	**Contractor Overhead**					
a	Profit	%	12.50%	$5,702,500	$713,000	
b	Mobilization	%	5.00%	$5,702,500	$285,000	
c	Insurance	%	1%	$5,702,500	$57,000	
d	Bonding	%	1.50%	$5,702,500	$86,000	
						$1,141,000
2	**General Site Work and Yard Piping**					
a	Screw Pump Rehab	ls	1	$300,000.00	$300,000	
b	Screens	ea	2	$120,000.00	$240,000	
c	Miscellaneous Valves/Gates	ea	4	$5,000.00	$20,000	
d	Yard Piping	ls	1	$150,000.00	$150,000	
e	General Site Work	ls	1	$200,000.00	$200,000	
f	Landscaping	ls	1	$80,000.00	$80,000	
g	Rehabilitate Existing Concrete (Painting/Coating)	ls	1	$200,000.00	$200,000	
h	Electrical/Control Work	%	25%	$540,000.00	$135,000	
						$1,325,000
3	**Secondary Treatment Processes**					
a	Admin/Blower Building	sf	1,500	$150.00	$225,000	
b	Furnish/Install Blowers	ea	3	$80,000.00	$240,000	
c	Furnish/Install Aeration Diffusers	ea	2	$125,000.00	$250,000	
d	Furnish/Install Mixers	ea	3	$50,000.00	$150,000	
e	Secondary Clarifier Concrete	cu yd	200	$1,000.00	$200,000	
f	Furnish/Install Clarifier Mechanism	ea	3	$85,000.00	$255,000	
g	Furnish/Install Aluminum Slide Gates	ls	6	$6,000.00	$36,000	
h	Furnish/Install RAS/WAS Pumps	ea	5	$30,000.00	$150,000	
i	Furnish/Install Mechanical Piping	ls	1	$100,000.00	$100,000	
j	Furnish/Install Splitting Structure	ls	1	$40,000.00	$40,000	
k	Electrical/Control Work	%	25%	$1,646,000.00	$411,500	
						$2,057,500
4	**Tertiary Treatment Processes**					
a	Cloth Filter Concrete	cu yd	60	$1,000.00	$60,000	
b	Furnish/Install Cloth Filter Equipment	ls	1	$200,000.00	$200,000	
c	Furnish/Install UV Equipment	ls	1	$500,000.00	$500,000	
d	Furnish/Install Effluent Booster Pumps	ea	3	$60,000.00	$180,000	
e	Electrical/Control Work	%	25%	$940,000.00	$235,000	
						$1,175,000
5	**Solids Handling**					
a	Rehabilitate Sludge Holding Tank Equipment	ls	1	$40,000.00	$40,000	
b	Furnish/Install Screw Press	ea	2	$250,000.00	$500,000	
c	Electrical/Control Work	%	25%	$540,000.00	$135,000	
						$675,000
6	**Additional Electrical**					
a	New Gear	ls	1	$200,000.00	$200,000	
b	Backup Generator	ls	1	$150,000.00	$150,000	
c	SCADA/Telemetry System	ls	1	$120,000.00	$120,000	
						$470,000
Construction Cost Subtotal						**$ 6,843,500**
Contingency (20%)						**$ 1,369,000**
Engineering Services						**$ 821,000**
Const Services						**$ 739,000**
TOTAL COST						**$ 9,772,500**

OPTION #2 – MEMBRANE BIO-REACTOR UPGRADE, 1.0 MGD

1. Re-equip the headworks lift station – The existing screw pump station, which raises the influent wastewater so it can flow by gravity through the treatment processes, requires improvements. The equipment, gates and screw pumps, will need to be replaced and the concrete structures may also require some rehabilitation to provide for a 20-year design life.

2. Install new screening equipment – The headworks channels are still in tact, but new screening equipment is required as the first part of treatment. Fine screening equipment is recommended that will remove all debris larger than 2-3mm in size. This removes rags and other deleterious material that can impact the downstream treatment processes, pumps or other equipment, and the final effluent. It is anticipated that two (2) complete screens will be installed to provide duty and standby operation for this process. This is a critical process prior to using membrane filters in wastewater.

3. Rehabilitate oxidation ditch with new aeration and mixing – The oxidation ditch concrete is intact but all of the ancillary equipment has been removed. Thus, new aeration equipment and mixers will be installed in the ditch and the influent and effluent structures will be rehabilitated with necessary gates and valves to allow for proper operations. The aeration equipment will include fine bubble diffusers, which considering the 12’ water depth in the ditch, is the most efficient form of transferring oxygen into the process. The diffusers will require the installation of blowers to provide process air, which are discussed in item #9. The mixers will be low speed mixers providing the needed velocity in the ditch.

4. New membrane tank and equipment – Concrete tanks will have to be constructed for installation of the membrane equipment. These tanks will be slightly different based on the membrane manufacturer but will provide for separate trains for this treatment process. The tanks will be covered to prevent any debris from entering the waste stream.

5. Convert secondary clarifier to sludge storage – The existing 35’ diameter tanks can be converted to store wasted solids. These tanks would provide additional storage capacity. Some diffusers and mixers would be installed in the tanks to keep them adequately aerated and mixed.

6. Convert chlorine contact basin to ultra violet disinfection – With the membrane process, ultra violet disinfection is recommended also. This could be installed in the chlorine contact basin with some simple modifications to the concrete.

7. Rehabilitate booster pump station – New pumps and piping will be installed to provide for effluent pumping requirements. This can be installed in the existing effluent booster wet well.

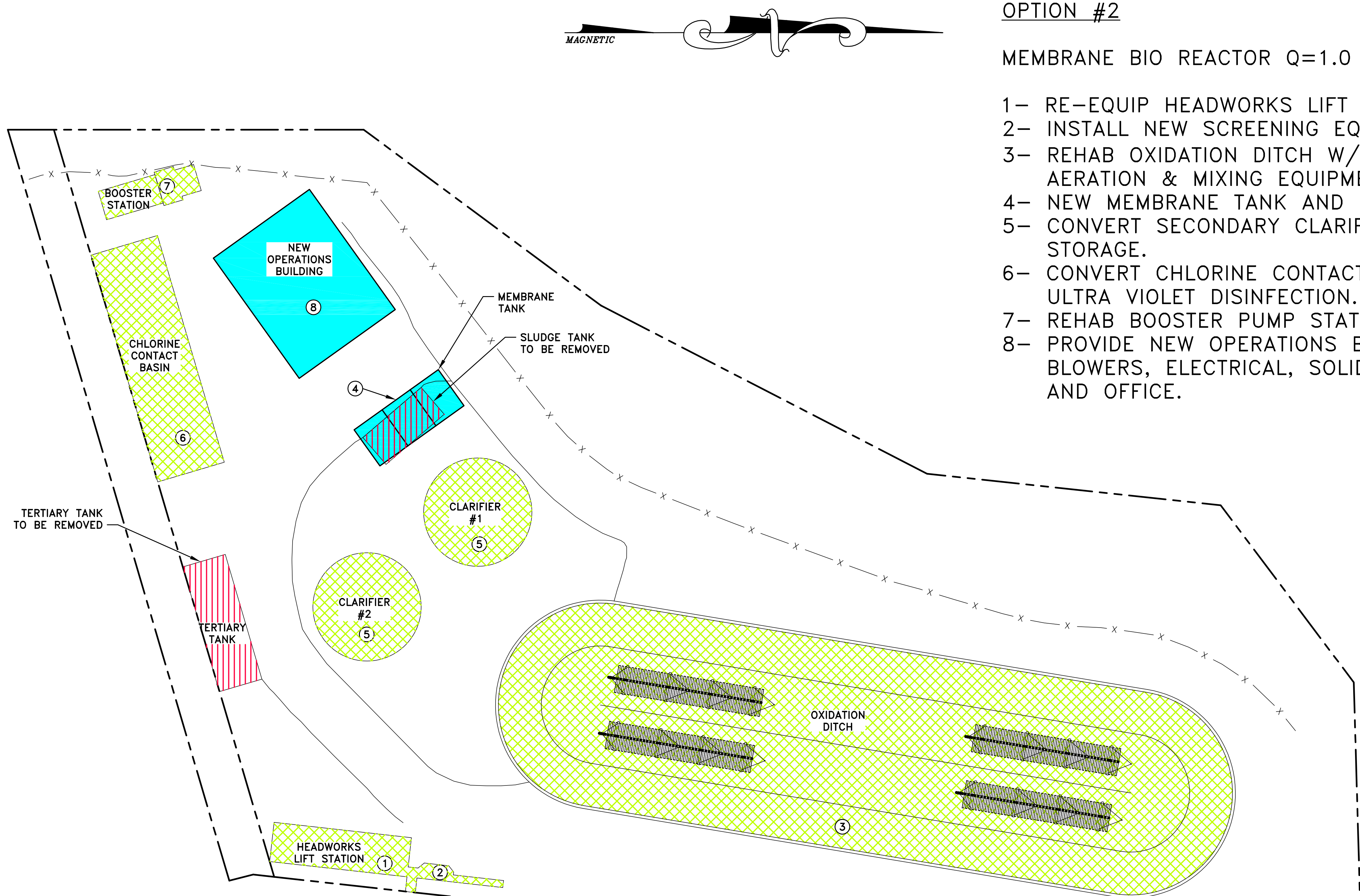
8. Provide new operations building – A building will be constructed on site to house the process blowers, permeate pumps, chemical cleaning equpment, electrical gear, solids handling process, lab, and office. The blowers will be high efficiency turbo blowers and will provide air mainly to the oxidation ditch and the sludge holding tanks. Permeate pumps, chemical cleaning equipment and a few other items ancillary to the membrane process will be installed in the building. The solids handling process will include dewatering equipment, like a screw or belt press, that will dewater the wasted solids to about 16%. The solids will then be conveyed to a haul off unit or truck to be hauled off site for disposal. An electrical room will be provided to house the MCCs, PLC panels, and other electrical equipment. A lab and office will be provided for operational uses.

KRB 08/12/2010 X:\Indian Hills\1drawings\site base.dwg

OPTION #2

MEMBRANE BIO REACTOR Q=1.0 MGD

1– RE–EQUIP HEADWORKS LIFT STATION.
2– INSTALL NEW SCREENING EQUIPMENT.
3– REHAB OXIDATION DITCH W/NEW AERATION & MIXING EQUIPMENT.
4– NEW MEMBRANE TANK AND EQUIPMENT.
5– CONVERT SECONDARY CLARIFIER TO SLUDGE STORAGE.
6– CONVERT CHLORINE CONTACT BASIN TO ULTRA VIOLET DISINFECTION.
7– REHAB BOOSTER PUMP STATION.
8– PROVIDE NEW OPERATIONS BUILDING WITH BLOWERS, ELECTRICAL, SOLIDS HANDLING, AND OFFICE.



LEGEND

REFURBISHED STRUCTURES:

NEW STRUCTURES:

DEMOLISHED STRUCTURES:

0 1/2 1

DRAWING IS NOT TO SCALE IF BAR DOES NOT MEASURE 1"

SHEET

AQUA ENGINEERING, INC.
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PHONE (801) 299-1327 FAX (801) 299-0153

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FAX (951) 788–1256

PLANS PREPARED UNDER THE SUPERVISION OF:

BRIAN P. KNOLL
REGISTERED CIVIL ENGINEER NO. C65690
REGISTRATION EXPIRES 9/30/07
DATE

INDIAN HILLS

WATER RECLAMATION FACILITY UPGRADE

PROPOSAL

OPTION #2

ORIGINAL				
NO.	DATE	DESIGN	DRAWN	CHECKED
0	–	–	–	–

REVISIONS

Membrane Bio Reactor Upgrade - 1.0 MGD

	ITEM	UNIT	QUANTITY	UNIT PRICE	SUBTOTAL	TOTAL
1	**Contractor Overhead**					
a	Profit	%	12.50%	$6,670,000	$834,000	
b	Mobilization	%	5.00%	$6,670,000	$334,000	
c	Insurance	%	1%	$6,670,000	$67,000	
d	Bonding	%	1.50%	$6,670,000	$100,000	
						$1,335,000
2	**General Site Work and Yard Piping**					
a	Screw Pump Rehab	ls	1	$300,000.00	$300,000	
b	Screens	ea	2	$150,000.00	$300,000	
c	Miscellaneous Valves/Gates	ea	4	$5,000.00	$20,000	
d	Yard Piping	ls	1	$150,000.00	$150,000	
e	General Site Work	ls	1	$200,000.00	$200,000	
f	Landscaping	ls	1	$80,000.00	$80,000	
g	Rehabilitate Existing Concrete (Painting/Coating)	ls	1	$200,000.00	$200,000	
h	Electrical/Control Work	%	25%	$600,000.00	$150,000	
						$1,400,000
3	**Secondary Treatment Processes**					
a	Blower Building	sf	2,000	$150.00	$300,000	
b	Furnish/Install Blowers	ea	3	$80,000.00	$240,000	
c	Furnish/Install Aeration Diffusers	ea	2	$150,000.00	$300,000	
d	Membrane Tank Concrete	cu yd	200	$1,000.00	$200,000	
e	Furnish/Install Membrane Equipment (1.0 mgd)	ls	1	$1,200,000.00	$1,200,000	
f	Furnish/Install Membrane Blowers	ea	3	$65,000.00	$195,000	
g	Furnish/Install Aluminum Slide Gates	ls	6	$5,000.00	$30,000	
h	Furnish/Install RAS/WAS Pumps	ea	3	$45,000.00	$135,000	
i	Furnish/Install Mechanical Piping	ls	1	$200,000.00	$200,000	
j	Electrical/Control Work	%	25%	$2,800,000.00	$700,000	
						$3,500,000
4	**Tertiary Treatment Processes**					
a	Furnish/Install UV Equipment	ls	1	$300,000.00	$300,000	
b	Furnish/Install Effluent Booster Pumps	ea	3	$60,000.00	$180,000	
c	Electrical/Control Work	%	25%	$480,000.00	$120,000	
						$600,000
5	**Solids Handling**					
a	Sludge Storage Tank Equipment	ls	1	$60,000.00	$60,000	
b	Furnish/Install Screw Press	ea	2	$250,000.00	$500,000	
c	Electrical/Control Work	%	25%	$560,000.00	$140,000	
						$700,000
6	**Additional Electrical**					
a	New Gear	ls	1	$200,000.00	$200,000	
b	Backup Generator	ls	1	$150,000.00	$150,000	
c	SCADA/Telemetry System	ls	1	$120,000.00	$120,000	
						$470,000
Construction Cost Subtotal						**$ 8,005,000**
Contingency (20%)						**$ 1,601,000**
Engineering Services						**$ 961,000**
Const Services						**$ 865,000**
TOTAL COST						**$ 11,432,000**

APPENDIX D

Cost Estimates

Table D-1
Pipeline Cost Estimate

Reach	Diameter	Length	Unit Cost	Construction Cost	Project Cost[1]
1	12	4,421	$145	$641,045	$900,000
	16 [2]	4,421	$165	$729,465	$1,020,000
2	12	3,180	$145	$461,100	$650,000
3	6	1,389	$125	$173,625	$240,000
	10	5,232	$135	$706,320	$990,000
4	12	2,524	$145	$365,980	$510,000
	16 [2]	2,524	$165	$416,460	$580,000
5A	12	7,773	$145	$1,127,085	$1,580,000
5B	12	2,414	$145	$350,030	$490,000
5C	6	3,200	$125	$400,000	$560,000
	12 [2]	3,200	$145	$464,000	$650,000
6	12	5,350	$145	$775,750	$1,090,000
7	16	11,900	$165	$1,963,500	$2,750,000
8	16	7,000	$165	$1,155,000	$1,620,000

[1]Project cost is 1.4 times construction cost rounded to nearest $10,000. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and basic environmental documentation. Costs are based on Engineering News Record (ENR) Construction Cost Index - Los Angeles, July 2010 (ENR=9968.69). Escalation, financing, interest during construction, legal, land, R-O-W agent, and environmental impact report costs are not included

[2]Pipe size for Option 4

Table D-2
Facility Cost Estimate

Facility	Construction Cost	Project Cost[1]
Sunnyslope Reservoir (Renovation)	$35,714	$50,000
Well 21 Second Well	$500,000	$700,000
Upgrade Well No. 5	$107,143	$150,000
Indian Hills WWTP Booster (Option 3)	$414,286	$580,000
Indian Hills WWTP Booster (Option 4)	$535,714	$750,000
Booster Station (two 40 hp pumps and perimeter block wall)	$200,000	$280,000

[1]Project cost is 1.4 times construction cost rounded to nearest $10,000. Project cost includes: construction costs, construction contingencies, design engineering including plans and specifications; design and construction surveying and mapping; geotechnical evaluation and report; engineering contract administration; field inspection and basic environmental documentation. Costs are based on Engineering News Record (ENR) Construction Cost Index - Los Angeles, July 2010 (ENR=9968.69). Escalation, financing, interest during construction, legal, land, R-O-W agent, and environmental impact report costs are not included